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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

First Semester, B.E. - Semester End Examination; May - 2022

Engineering Mechanics

(Common to All Branches)

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Apply the knowledge of basic science and mathematics to classify the force systems and compute its resultant.

CO2: Analyse the system of forces in equilibrium with or without frictional forces.

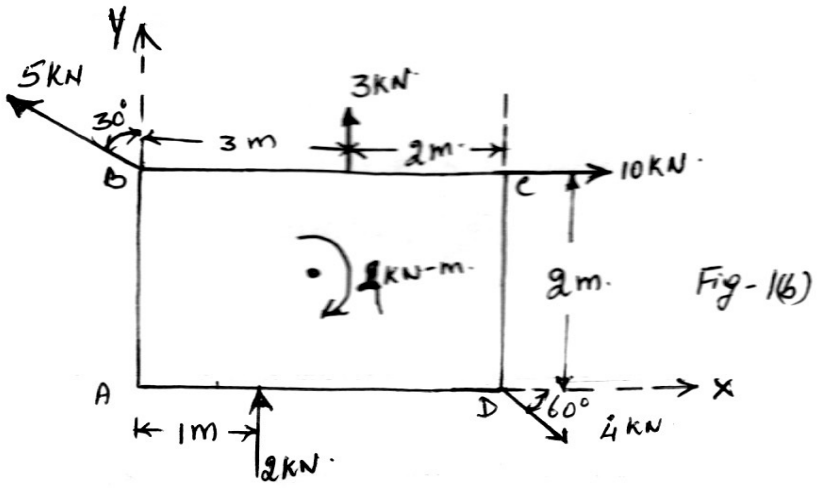
CO3: Locate the Centroid and composite moment of inertia of irregular and built up sections.

CO4: Analyse the problems with respect to linear motion, curvilinear motion and energy.

***Note**: I) **PART - A** is compulsory. **Two** marks for each question.*

*II) **PART - B**: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.*

Q. No.		Questions	Marks
		I : PART - A	**10**
I	a.	With neat sketch, explain principle of transmissibility.	2
	b.	Write a note on angle of friction.	2
	c.	Differentiate between Centroid and Center of gravity.	2
	d.	With neat sketch, explain polar moment of Inertia.	2
	e.	Write a brief note on "Energy".	2
		II : PART - B	**90**
		UNIT - I	**18**
1	a.	Explain: i) Composition and Resolution forces ii) Lamias Theorem iii) Varignon's theorem	9
	b.	Find the magnitude and direction of the resultant for the force system acting on a plate as shown in the Fig. 1(b). Also find the points where the resultant will cut *X* and *Y* axis.	9



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c. Find the tensions in the strings of the connected system shown in Fig. 1(c). Determine the weights W_1 and W_2 such that portion BC is horizontal. Assume pulley is frictionless. 9

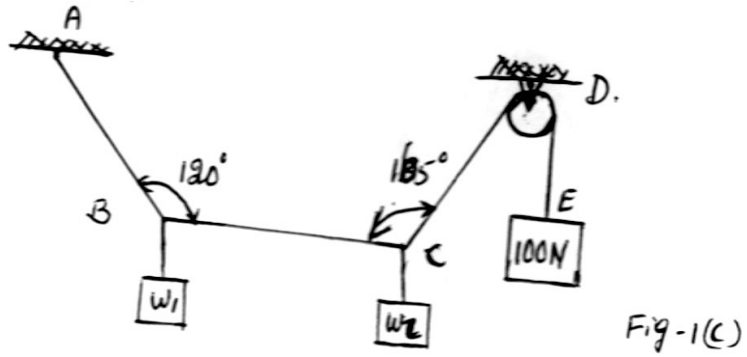
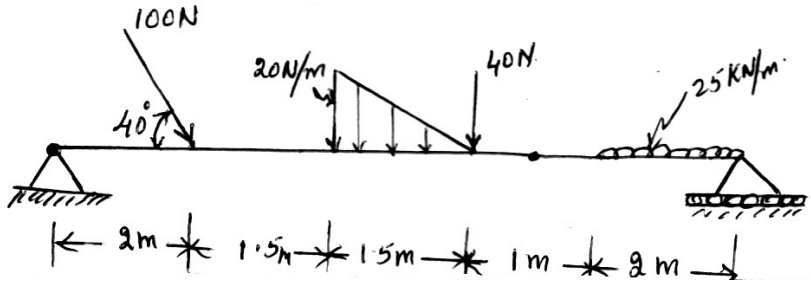


Fig-1(c)

UNIT - II **18**

2 a. List different types of load that are commonly applied on a member with their reduced concentrated loads. 9

b. Determine the reactions at the support for the beam loaded as shown in below figure. 9



c. A 4 m long ladder supported by a wall rest on a horizontal floor is on the verge of sliding motion. Coefficient of friction between wall and the ladder is 0.3 and between floor and ladder is 0.4, the weight of the ladder is 80 N and supports a man of weight 300 N at a distance of 3 m from the bottom along ladder. Compute the reactions at contact points and also find the angle between ladder and floor on its verge of motion. 9

UNIT - III **18**

3 a. Explain:

i) Axis of symmetry and Axis of reference

ii) By the method of integration obtain an expression for the centroidal coordinates of breadth "b" and depth "d" 9

b. Locate the centroidal coordinates of the hatched portion of the Lamina shown in Fig. 3(b) 9

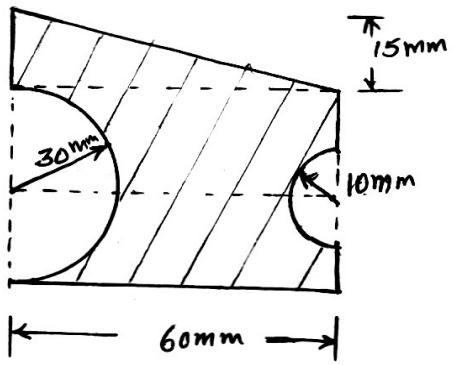


Fig 3(b).

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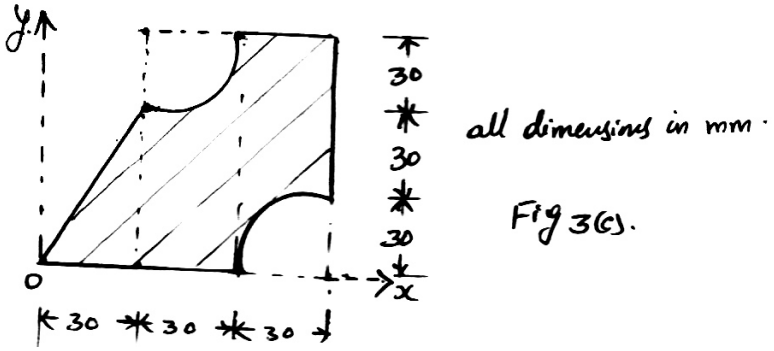
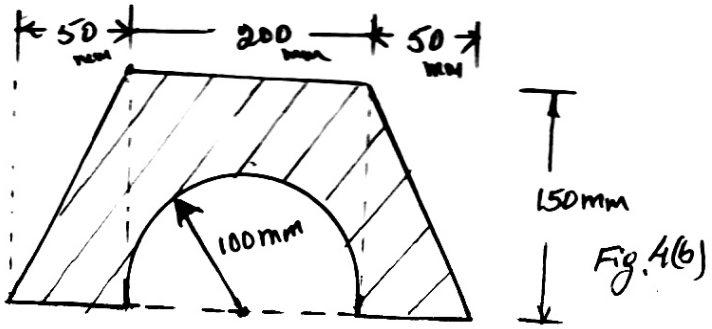
c. Locate the centroidal of the hatched portion of the area shown in Fig. 3(c) about *ox* and *oy* axis. 9



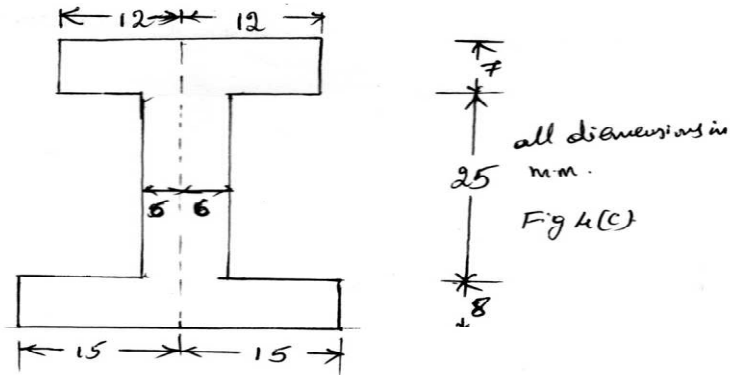
UNIT - IV **18**

4 a. i) Explain Radius of gyration. 9
ii) State and prove perpendicular axis theorem.

b. Determine the moment of Inertia about the centroidal horizontal axis of the shaded area shown in Fig 4(b). Also find the radius of gyration about the same. 9



c. Determine the M.I. of the built up area shown in Fig.4(c) about its centroidal axis. 9



UNIT - V **18**

5 a. Explain the following with their expressions: 9
i) Acceleration and retardation ii) Super Elevation iii) D'Alembert's principle

b. A particle is projected at an angle of 30° to horizontal with a velocity of 80 m/s. 9
Determine: i) Horizontal range ii) Maximum height iii) Time flight
Take; $g = 9.81$ m/s^2.

c. A pile hammer weighing 200 N fall on a pile. If the hammer drops freely from a height of 6 m. Find the implosive force blow. If the hammer comes rest in 1/100 of second take $g = 9.81$ m/s^2. 9

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